

# ***IFO AUDIT GUIDE***

## ***Underwater Facility and Non-Open Water Operations***

TABLE OF REFERENCES

<b>Document Number</b>	<b>Title</b>
NSS 1740.10	NASA Safety Standard for Underwater Facility and Non-Open Water Operations

<b><i>Underwater Facility and Non-Open Water Operations</i></b>			
<b>ATTRIBUTE</b>	<b>SOURCE</b>	<b>SAT/ UNSAT</b>	<b>REMARK/COMMENT</b>
<b>A. System Safety Program</b>			
1. Has the Center established an effective system safety program for all neutral buoyancy facility development and modification projects, associated human underwater activities and equipment, and research operations?	NSS 1740.10, Para. 100		
2. Have system safety program responsibilities been designated and assigned to a Safety, Reliability, and Quality Assurance (SR&QA) organization office that is independent from the underwater neutral buoyancy facility management?	NSS 1740.10, Para. 100.a		
3. Have system safety analyses been performed and documented for all facilities, human testing equipment, and procedures within the scope of NSS 1740.10 that perform a critical function?	NSS 1740.10, Para. 100.b		
4. Do hazard analysis reports, as a minimum, document: <ul style="list-style-type: none"> <li>a. A listing of all credible hazards?</li> <li>b. Specific controls for the identified hazards?</li> <li>c. Verification of the hazard control implementation?</li> <li>d. Acceptance of the residual hazards by appropriate Center management?</li> <li>e. Specific safety requirements?</li> </ul>	NSS 1740.10, Para. 100.b		
5. Are additional system safety analyses required by Center safety office when appropriate to support the hazard listing (e.g., PHA, SHA, OHA, FMEA, Common Cause Failure Analysis, Fault Tree Analysis)?	NSS 1740.10, Para. 100.c		
6. Have procedures and practices been developed for use before facility test team and support personnel training and the start of all hazardous operations? <ul style="list-style-type: none"> <li>a. Are they approved by the Test Readiness Review Board?</li> </ul>	NSS 1740.10, Para. 100.d		

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<b>B. Quality Assurance Program</b>			
1. What quality assurance functions are performed to verify conformance with the requirements of NSS 1740.10 and local procedures?	NSS 1740.10, Para. 101		
2. Have quality and inspection procedures and guidelines been established? a. How do you ensure they are understood by all test team personnel before any human underwater or training activities?	NSS 1740.10, Para. 101.a		
3. Does the Center, in addition to normal management surveillance, conduct a formal safety evaluation review at least annually to evaluate all neutral buoyancy facility programs for compliance with this standard and sound safety practices? a. Does the contractor do the same?	NSS 1740.10, Para. 203		
4. Is the review conducted by an evaluation team made up of safety, quality assurance, medical, facility user, and other organization personnel?	NSS 1740.10, Para. 203.a		
5. Is an evaluation report submitted to the Center Director, NASA contractor management, and NASA Headquarters Chief Officer of Safety and Mission Assurance?	NSS 1740.10, Para. 203.b		
6. Has a quality assurance representative been assigned? a. Who is it?	NSS 1740.10, Para. 101.b		

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<p>7. Does the quality assurance representative:</p> <ul style="list-style-type: none"> <li>a. Develop and maintain the facility project quality assurance plan and Center procedures and checklists necessary to implement its provisions?</li> <li>b. Review, verify, and approve all proposed facility modifications, repair, and nonroutine maintenance for impact on the facility configuration?</li> <li>c. Review and approve all facility work authorization documents?</li> <li>d. Assist in the operational readiness inspection of the facility and systems, and document any nonconformance?</li> <li>e. Verify that all facility and unique human testing equipment is adequate to support the test objectives?</li> <li>f. Review and approve all nonconformance report dispositions and resolutions?</li> <li>g. Review and approve all test and training procedures and facility operating procedures?</li> <li>h. Verify that all instruments are in proper calibration and that instruments without valid certification are withheld from use?</li> <li>i. Verify the certification of all facility pressurized systems and components in use?</li> <li>j. Verify that all diver and hyperbaric chamber breathing air meets requirements?</li> <li>k. Be present or on call within 5 minutes during facility human underwater activities?</li> </ul>	NSS 1740.10, Para. 101.b		

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<b>C. Personnel Qualifications</b>			
1. Have training, qualification, and certification requirements for test team members been established? a. Where are they documented?	NSS 1740.10, Para. 102.b(1)		
2. Do certification procedures require a demonstration of specific system and equipment knowledge and understanding of the facility operation capabilities in all possible diving modes?	NSS 1740.10, Para. 102.b(3)		
3. Are test team personnel certifications attested to by the appropriate Center management office and documented in training records?	NSS 1740.10, Para. 102.b(3)		
4. Is recertification training conducted at least every 4 years? a. How are personnel informed when their certification expires?	NSS 1740.10, Para. 102.b(3)		
5. Are periodic drills conducted to maintain proficiency in emergency and off-nominal procedures? a. Are these drills documented?	NSS 1740.10, Para. 102.b(2)		
6. Are all potential underwater personnel administered physical examinations at least annually to certify they are able to perform under hyperbaric exposure? a. Are these documented?	NSS 1740.10, Para. 201.a(3)		
7. Does the NASA Center medical organization provide diving medical support, consultation, and the services of qualified medical diving team personnel to support underwater operations? a. Are qualifications unique to these operations documented?	NSS 1740.10, Para. 201		

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<p><b>D. Procedures</b></p> <p>1. Have operation and maintenance procedures been developed for NASA neutral buoyancy operations and facilities?</p> <p>a. What is the process each facility uses to maintain them?</p>	NSS 1740.10, Para. 302		
<p>2. Review general operating procedures. Do they contain:</p> <p>a. Facility organization and responsibilities?</p> <p>b. Test team certification requirements?</p> <p>c. Facility equipment and outside support requirements?</p> <p>d. A facility maintenance plan?</p> <p>e. Testing/training rules for all diving modes of operation?</p>	NSS 1740.10, Para. 302.a		
<p>3. Do standard operating procedures exist for:</p> <p>a. Implementing the master equipment list and tool list maintenance and replenishment actions?</p> <p>b. Prescribing facility planning for proposed facility repairs, rehabilitation and modification, and new construction projects?</p> <p>c. Describing the special handling, storage, transportation, and refurbishment procedures for complex test articles and associated components?</p>	NSS 1740.10, Para. 302.b		
<p>4. Are there specific operating procedures for:</p> <p>a. Configuration control for the facility and equipment?</p> <p>b. Routine maintenance actions?</p> <p>c. Equipment calibration actions?</p> <p>d. Periodic validation of facility and equipment operation and functional integrity?</p> <p>e. Equipment startup and shutdown?</p>	NSS 1740.10, Para. 302.b		

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<p>5. Have testing and training organizations developed and documented all necessary procedures for safe neutral buoyancy testing and training activities?</p> <p>a. Have procedures and changes been approved by the facility manager; Center-designated safety, quality assurance, and medical offices; and test engineering or other concerned organizations?</p>	NSS 1740.10, Para. 300.b		
<p>6. Have Facility Emergency Procedures been established and maintained by each facility to cover personnel actions in the event of a facility emergency such as fire, hazardous substance spill, loss of power, earthquake, or medical emergency?</p> <p>a. Are they practiced at least annually?</p>	NSS 1740.10, Para. 302.c, 201		
<b>E. Facility Certification and Modification</b>			
<p>1. Do existing facilities comply with federal, national, state, and local building codes and NASA policies for underwater facilities for research and neutral buoyancy testing?</p>	NSS 1740.10, Para. 200.a		
<p>2. Are modifications of existing or approved neutral buoyancy facilities accomplished in compliance with applicable requirements?</p> <p>a. Is there a local procedure governing modifications to these facilities? (Review the procedure.)</p> <p>b. Is there evidence that modifications are approved by the quality assurance representative as required?</p>	NSS 1740.10, Paras. 200.c, 101.b		
<p>3. Have neutral buoyancy facilities, including the hyperbaric chamber, been certified for underwater activities by an Operational Readiness Inspection?</p> <p>a. Is certification documented?</p>	NSS 1740.10, Para. 200.d		

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<b>F. Testing Operations</b>			
1. Is a Test Readiness Review Board established before each new test or new series of tests, including facility training activities?	NSS 1740.10, Para. 300.a		
2. Are test plans reviewed and approved by the Board membership?	NSS 1740.10, Para. 300.a(2)		
3. Are approved test plans and all test procedures available to appropriate test team personnel at their duty stations?	NSS 1740.10, Para. 300.c		
4. How is it determined that test team personnel have the proper knowledge, training, and certifications required by their position prior to conducting any human testing or training activity?	NSS 1740.10, Para. 102.a		
5. Are comprehensive briefings of the test team conducted before underwater neutral buoyancy facility pre-dive operations? a. Do briefings include review of current certification of all test team personnel?	NSS 1740.10, Para. 301.a, 301.a(6)		
6. Are pretest checklists completed and verified by the quality assurance representative? a. Examples?	NSS 1740.10, Para. 301.b		
7. Are all potential underwater personnel interviewed by a medical representative before each test or training activity?	NSS 1740.10, Para. 201.b(2)		

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8. Is there a hyperbaric chamber available within 5 minutes of the buoyancy facility when required? a. If one is not required, is access to a hyperbaric system prearranged?	NSS 1740.10, Para. 201.c		
9. Are certified Hyperbaric Chamber Operators and Hyperbaric Chamber Inside Attendants on hand for hyperbaric system operations?	NSS 1740.10, Para. 201.c		
10. How is it ensured that personnel support equipment requirements are met and maintained?	NSS 1740.10, Para. 202		
<b>G. Recordkeeping and Reporting</b> 1. Are diving-related injuries or illnesses requiring a test team member to be hospitalized for 24 hours or more documented on OSHA 29 CFR 1910, Subpart T (Section 1910.440) forms? a. Are there any recent examples?	NSS 1740.10, Para. 204		
2. Are records retention requirements pertaining to no-open water operations met as follows: a. Test team member medical reports – 5 years. b. Recording of a dive – 1 year, 5 if there was a decompression sickness incident. c. Equipment inspections and testing records – retain current record entries or tag, or until equipment is withdrawn from service.	NSS 1740.10, Para. 202		
3. Are records of all maintenance actions accomplished on the facility diving equipment and support apparatus maintained?	NSS 1740.10, Para. 202		